Part 1

BuildingNewFunctions

BNF1.tex

Exercise 1 *Let f be a function defined by $f(x) = x^2$ and g be a function defined by $g(x) = -5x+3$. Use the pair of functions f and g to find the following values, if they exist. If the value does not exist, enter DNE.*

(a) $(f+g)(2) = \boxed{-3}$

(b) $(f-g)(-1) = \boxed{-7}$

(c) $(g-f)(1) = \boxed{-3}$

(d) $(f \cdot g)\left(\frac{1}{2}\right) = \boxed{\frac{1}{8}}$

(e) $\left(\frac{f}{g}\right)(0) = \boxed{0}$

(f) $\left(\frac{g}{f}\right)(-2) = \boxed{\frac{13}{4}}$

BNF2.tex

Exercise 2 *Let f be a function defined by $f(x) = 3x$ and g be a function defined by $g(x) = \dfrac{1}{3x+1}$. Use the pair of functions f and g to find the following values, if they exist. If the value does not exist, enter DNE.*

(a) $(f+g)(2) = \boxed{\frac{43}{7}}$

(b) $(f-g)(-1) = \boxed{-\frac{5}{2}}$

(c) $(g-f)(1) = \boxed{-\frac{11}{4}}$

(d) $(f \cdot g)\left(\frac{1}{2}\right) = \boxed{\frac{3}{5}}$

(e) $\left(\frac{f}{g}\right)(-2) = \boxed{30}$

(f) $\left(\frac{g}{f}\right)(0) = \boxed{DNE}$

BNF3.tex

Exercise 3 *Let f be a function defined by $f(x) = x^3$ and g be a function defined by $g(x) = \dfrac{1}{x^3}$. Use the pair of functions f and g to find the following values, if they exist. If the value does not exist, enter DNE.*

(a) $(f+g)(2) = \boxed{\dfrac{65}{8}}$

(b) $(f-g)(-1) = \boxed{0}$

(c) $(g-f)(1) = \boxed{0}$

(d) $(f \cdot g)\left(\dfrac{1}{2}\right) = \boxed{1}$

(e) $\left(\dfrac{f}{g}\right)(0) = \boxed{DNE}$

(f) $\left(\dfrac{g}{f}\right)(-2) = \boxed{\dfrac{1}{64}}$

BNF4.tex

Exercise 4 *Consider the functions f and g defined by the table of values below.*

x	$f(x)$
-3	2
-2	4
-1	0
0	2
1	2
2	3
3	-2

x	$g(x)$
-3	-3
-2	-1
-1	-3
0	0
1	3
2	1
3	2

Use the pair of functions f and g to find the following values, if they exist. If the value does not exist, enter DNE.

(a) $(f+g)(-3) = \boxed{-1}$

(b) $(f-g)(2) = \boxed{2}$

(c) $(f \cdot g)(-1) = \boxed{0}$

(d) $(g-f)(1) = \boxed{1}$

(e) $\left(\frac{f}{g}\right)(0) = \boxed{DNE}$

(f) $\left(\frac{f}{g}\right)(3) = \boxed{-1}$

(g) $\left(\frac{g}{f}\right)(-1) = \boxed{DNE}$

(h) $(g \cdot f)(-2) = \boxed{-4}$

`BNF5.tex`

Exercise 5 *Say a store sells various fruits. Let $B(t)$ represent the number of bananas sold on day t and $M(t)$ represent the number of mangos sold on day t. Say $P(t)$ represents the price of bananas on day t and $Q(t)$ represents the price of mangos on day t.*

(a) *Which of the following represents the total number of bananas and mangos sold on day t?*

Multiple Choice:

(i) $(B+M)(t)$ ✓

(ii) $(B-M)(t)$

(iii) $(B \cdot M)(t)$

(iv) $\left(\frac{B}{M}\right)(t)$

(b) *Which of the following represents the total money $R(t)$ made by selling bananas on day t?*

Multiple Choice:

(i) $(B+P)(t)$

(ii) $(B-P)(t)$

(iii) $(B \cdot P)(t)$ ✓

(iv) $\left(\frac{B}{P}\right)(t)$

(c) *Which of the following represents the total money $S(t)$ made by selling mangos on day t?*

Multiple Choice:

(i) $(M+Q)(t)$

(ii) $(Q-M)(t)$

(iii) $(M\cdot Q)(t)$ ✓

(iv) $\left(\frac{M}{Q}\right)(t)$

Which of the following represents the total money made by selling bananas and mangos on day t?

Multiple Choice:

(a) $(R+S)(t)$ ✓

(b) $(R-S)(t)$

(c) $(R\cdot S)(t)$

(d) $\left(\frac{R}{S}\right)(t)$

`BNF6.tex`

Exercise 6

Let h be a function defined by $h(x)=\dfrac{2\sin(3x)}{5\sqrt{3x^2}}$. Which of the following definitions of f and g satisfy $(f\cdot g)(x)=h(x)$?

Multiple Choice:

(a) $f(x)=2\sin(3x)$ *and* $g(x)=5\sqrt{3x^2}$

(b) $f(x)=\dfrac{1}{2\sin(3x)}$ *and* $g(x)=5\sqrt{3x^2}$

(c) $f(x)=\sin(3x)$ *and* $g(x)=\dfrac{10}{\sqrt{3x^2}}$

(d) $f(x) = \dfrac{2\sin(3x)}{5}$ and $g(x) = \dfrac{1}{\sqrt{3x^2}}$ ✓

Let h be a function defined by $h(x) = 2x^2 + 2x - 2$. Which of the following definitions of f and g satisfy $(f+g)(x) = h(x)$?

Multiple Choice:

(a) $f(x) = 2x^2$ and $g(x) = 2x + 2$

(b) $f(x) = x^2$ and $g(x) = x^2 + 2x$

(c) $f(x) = x^2 + x - 1$ and $g(x) = x^2 + x - 1$ ✓

(d) $f(x) = x^2$ and $g(x) = x^2 + 2x - 1$

Let h be a function defined by $h(x) = \sin(x) - \cos(x)$. Which of the following definitions of f and g satisfy $(f-g)(x) = h(x)$?

Multiple Choice:

(a) $f(x) = \sin(x) + \cos(x)$ *and* $g(x) = 2\cos(x)$ ✓

(b) $f(x) = 2\sin(x)$ *and* $g(x) = \cos(x)$

(c) $f(x) = \sin(x)$ *and* $g(x) = -\cos(x)$

(d) $f(x) = -\cos(x)$ *and* $g(x) = \sin(x)$

`BNF7.tex`

Exercise 7

Let h be a function defined by $h(x) = 5\tan(x)$. Which of the following definitions of f and g satisfy $\left(\dfrac{f}{g}\right)(x) = h(x)$?

Multiple Choice:

(a) $f(x) = 5\sin(x)$ *and* $g(x) = 5\cos(x)$

(b) $f(x) = \sin(x)$ *and* $g(x) = \cos(x)$

(c) $f(x) = \sin(x)$ *and* $g(x) = \dfrac{\cos(x)}{5}$ ✓

(d) $f(x) = 5\sin(x)$ *and* $g(x) = \dfrac{1}{5\cos(x)}$

Let h be a function defined by $h(x) = 2\tan(x)$. Which of the following definitions of f and g satisfy $(f \cdot g)(x) = h(x)$?

Multiple Choice:

(a) $f(x) = \tan(x)$ *and* $g(x) = 2\cos(x)$

(b) $f(x) = 2\sin(x)$ *and* $g(x) = \dfrac{1}{\cos(x)}$ ✓

(c) $f(x) = \cos(x)$ *and* $g(x) = 2\sin(x)$

(d) $f(x) = \dfrac{2}{\sin(x)}$ *and* $g(x) = \cos(x)$

Let h be a function defined by $h(x) = \sin(x)\tan(x)$. Which of the following definitions of f and g satisfy $(f \cdot g)(x) = h(x)$?

Multiple Choice:

(a) $f(x) = (\sin(x))^2$ *and* $g(x) = \cos(x)$

(b) $f(x) = \sin(x)$ *and* $g(x) = \dfrac{1}{\cos(x)}$

(c) $f(x) = (\sin(x))^2$ *and* $g(x) = \dfrac{1}{\cos(x)}$ ✓

(d) $f(x) = \cos(x)$ *and* $g(x) = \left(\dfrac{1}{\sin(x)}\right)^2$

`BNF8.tex`

Exercise 8 *Let's discuss some of the properties of the tangent function.*

(a) *Recall that the sine function is odd and the cosine function is even. Using the fact that* $\tan(x) = \dfrac{\sin(x)}{\cos(x)}$, *we can deduce that tangent is*

Multiple Choice:

(i) *odd.* ✓

(ii) *even.*

(iii) *neither odd nor even.*

(b) *Recall that the tangent function has period* π*. Using the fact that* $\tan\left(-\frac{\pi}{3}\right) = -\sqrt{3}$*, answer the following questions.*

What is $\tan\left(\frac{2\pi}{3}\right)$*?*

Multiple Choice:

(i) $\sqrt{3}$

(ii) $-\sqrt{3}$ ✓

(iii) 3

(iv) -3

(v) -1.72

What is $\tan\left(\frac{\pi}{3}\right)$*?*

Multiple Choice:

(i) $\sqrt{3}$ ✓

(ii) $-\sqrt{3}$

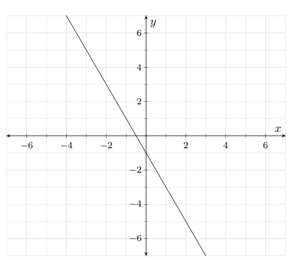
(iii) 3

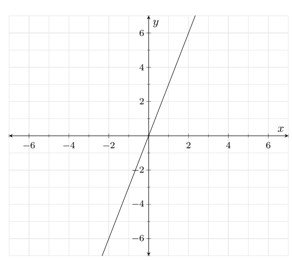
(iv) -3

(v) -1.72

BNF9.tex

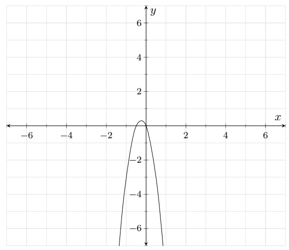
Exercise 9 *Look at the following graphs of the functions* f *(on the left) and* g *(on the right).*



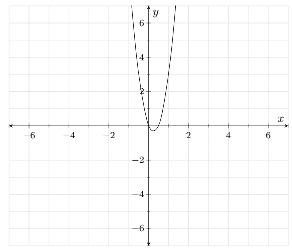


Which of the following is the graph of $f \cdot g$*?*

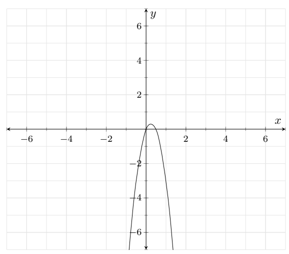
Graph A



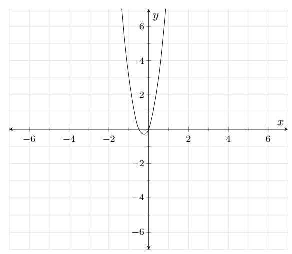
Graph B



Graph C



Graph D



Multiple Choice:

(a) *Graph A* ✓

(b) *Graph B*

(c) *Graph C*

(d) *Graph D*